

4K96-4

ALASKA DEPARTMENT OF FISH AND GAME  
REPORT TO THE ALASKA BOARD OF FISHERIES:  
A REVIEW OF INCIDENTAL RED KING CRAB  
BYCATCH IN THE BERING SEA TANNER CRAB  
FISHERY BETWEEN 1990 AND 1995

By

Donn Tracy  
and  
Doug Pengilly

Regional Information Report<sup>1</sup> No. 4K96-4

Alaska Department of Fish and Game  
Commercial Fisheries Management and Development Division  
211 Mission Road  
Kodiak, Alaska 99615

February 1996

---

<sup>1</sup>The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished division reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Commercial Fisheries Management and Development Division.

## **ACKNOWLEDGMENTS**

Gratitude is expressed to shellfish observers deployed onboard vessels in the Bering Sea Tanner crab fishery between 1990 and 1995.

The Bering Sea/Aleutian Islands commercial crab fishing fleet and processing industry should be commended for increasing and continued support of the State of Alaska Mandatory Shellfish Observer Program.

Acknowledgment is also given to the Pacific Fisheries Information Network (PacFIN) for recognizing the importance of annual funding in support of Bering Sea shellfish research.

## TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES .....	i
LIST OF FIGURES .....	ii
LIST OF APPENDICES .....	iii
INTRODUCTION .....	1
METHODS .....	1
At-Sea Observers .....	1
Catch Sampling .....	2
RESULTS AND DISCUSSION .....	3
Fishing and Sampling Effort .....	3
Red King Crab Bycatch .....	4
Abundance and Size Composition .....	4
Distribution .....	5
COMPENDIUM .....	6
LITERATURE CITED .....	7
TABLES .....	8
FIGURES .....	10
APPENDICES .....	17

## LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Commercial fishing and at-sea observer sampling effort in the 1990/91 through 1994/95 Bering Sea Tanner crab fishery .....	8
2. Incidental red king crab bycatch observed in pots sampled in the 1990/91 through 1994/95 Bering Sea Tanner crab fishery .....	9

## LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Size distribution of incidental male and female red king crabs observed in pots sampled east and west of 163° W. longitude during the 1990/91 Bering Sea Tanner crab fishery .....	10
2. Size distribution of incidental male and female red king crabs observed in pots sampled east and west of 163° W. longitude during the 1991/92 Bering Sea Tanner crab fishery .....	11
3. Size distribution of incidental male and female red king crabs observed in pots sampled east and west of 163° W. longitude during the 1992/93 Bering Sea Tanner crab fishery .....	12
4. Size distribution of incidental male and female red king crabs observed in pots sampled during the 1993/94 and 1994/95 Bering Sea Tanner crab fishery .....	13
5. Geographic distribution of pots sampled by observers during the 1990/91 Bering Sea Tanner crab fishery, and the corresponding incidental catch of male and female red king crabs .....	14
6. Geographic distribution of pots sampled by observers during the 1991/92 and Bering Sea Tanner crab fishery, and the corresponding incidental catch of male and female red king crabs .....	15
7. Geographic distribution of pots sampled by observers during the 1992/93 Bering Sea Tanner crab fishery, and the corresponding incidental catch of male and female red king crabs .....	16

## LIST OF APPENDICES

<u>Appendix</u>	<u>Page</u>
A1. Geographic distribution of tow station locations during the 1990 National Marine Fisheries Service (NMFS) crab stock assessment trawl surveys, and the corresponding relative density of male and female red king crabs at each station .....	18
A2. Geographic distribution of tow station locations during the 1991 NMFS crab stock assessment trawl surveys, and the corresponding relative density of male and female red king crabs at each station .....	19
A3. Geographic distribution of tow station locations during the 1992 NMFS crab stock assessment trawl surveys, and the corresponding relative density of male and female red king crabs at each station .....	20
A4. Geographic distribution of tow station locations during the 1993 NMFS crab stock assessment trawl surveys, and the corresponding relative density of male and female red king crabs at each station .....	21
A5. Geographic distribution of tow station locations during the 1994 NMFS crab stock assessment trawl surveys, and the corresponding relative density of male and female red king crabs at each station .....	22

## INTRODUCTION

The Bering Sea (Management Area Q) Tanner crab *C. bairdi* fishery has historically occurred in waters extending east from the Aleutian Basin to as far as 160° W. longitude in Bristol Bay; and ranging northeast and northwest from Unimak Island to approximately N58° latitude. Within this area vessel effort has been variably concentrated, although large catches of Tanner crabs have traditionally been reported between 161° and 165° W. longitude, and in waters adjacent to the Pribilof Islands. In 1993 the Alaska Board of Fisheries (BOF) adopted commercial shellfish regulations that reduced the geographic boundaries of this fishery, and subsequently affected both the annual harvestable surplus of Tanner crabs and the exploitation dynamics of the resource.

The board's action stemmed from concern over reports by the Alaska Department of Fish and Game (ADF&G) of excessive red king crab incidental catch during the Tanner seasons, most notably in waters east of 164° W. longitude. Data collected by at-sea observers deployed on catcher-processor vessels between 1988 and 1992 indicated that the bycatch of female and juvenile male red king crabs in this area might periodically exceed catches of targeted Tanner crabs (Tracy, 1992). In an effort to implement a means of protecting depressed red king crab stocks in the Bering Sea, the BOF agreed to restrict directed Tanner crab fishing to waters west of 163° W. longitude following closure of the Bristol Bay red king crab fishery, and also to require that commercial fishing vessels utilize Tanner crab pots containing tunnel openings with a maximum height of 3 inches. Concurrently, and in order to maintain an opportunity for a continued harvest in the restricted waters, the board adopted regulations allowing the retention of Tanner crabs, which normally occur as incidental catch, during the red king crab season.

The purpose of this report is to review fishery bycatch information that influenced the revision of Tanner crab regulations in 1993, and discuss similar data collected following implementation of these changes, by at-sea observers during the 1993/94 and 1994/95 Bering Sea fishery. As an aid in interpretation of catch statistics presented, the reader should recall that prior to 1993, in addition to maintaining unrestricted access to fishable waters east of 163° W. longitude during the season, vessels targeting Tanner crabs utilized pots containing a maximum tunnel height of 5 inches.

## METHODS

### *At-Sea Observers*

In 1988 the BOF directed ADF&G to implement an at-sea observer program in the Bering Sea/Aleutian Islands (BSAI) commercial king and Tanner crab fisheries. The intent of the board's action was to provide ADF&G with a means to monitor the fishing activities of catcher-processor vessels, and gather harvest information from vessels delivering catches to floating processors. The deployment of observers at-sea during the fisheries also allowed the department an opportunity to collect data relative to the life history biology and stock condition of targeted species, and assess the significance of incidental fishery bycatch. The initial regulatory provisions of the program also granted the department authority to place observers onboard any fishing vessel participating in new and high impact BSAI fisheries, particularly those where limited biological and other information

necessary for appropriate management measures was available. Since 1988, and at the departments request, the BOF has amended regulatory provisions of the program to include mandatory observer placement on all fishing vessels harvesting king crabs in the Aleutian Islands management areas, on processing vessels in the Bering Sea snow crab *C. opilio* fishery, and on commercial scallop vessels throughout state managed waters.

The presence of observers onboard vessels has principally been utilized as an enforcement monitoring tool, although catch data collected during at-sea deployments in the crab fisheries have aided in development of relative stock abundance models, provided geographic representations of fishing effort relative to stock distribution, revealed insights into species reproduction and growth characteristics, and have enabled documentation of non-target crab bycatch in pots. Harvest information necessary for effective inseason fishery management is also routinely reported to ADF&G by the onboard biologists.

In the Bering Sea Tanner crab fishery, at-sea observers completed a total of 119 deployments on 88 catcher-processors between 1990 and 1995 (Ward et al., 1995). During these trips the harvest rates for each observed vessel were recorded, along with the proportion of undersized and illegal crabs comprising the retained catches. Additionally, a number of fished pots were sampled for contents during the course of each observer's deployment. Summarized data from these samples provided ADF&G with descriptive statistics on the size, composition, and relative abundance per pot of red king crabs and other incidental shellfish species captured over a several year period.

### *Catch Sampling*

A complete description of shellfish observer vessel monitoring and catch sampling techniques is not given in this report. Comprehensive methodologies are detailed in the most recent publishing of the ADF&G Shellfish Observer Field Manual (ADF&G 1993).

Sampling of fished pots is normally conducted on a daily basis by observers deployed on catcher-only and catcher-processor vessels. During the 1990/91 and 1991/92 Tanner crab seasons a minimum of one pot per vessel fishing was examined for contents; in the 1993/94 and 1994/95 fishery an average of nearly 3 fished pots were sampled daily (Ward, pers. comm.). Tanner crab pots were selected for sampling on a random basis by each observer within every 24 hour interval of vessel fishing activity. In addition to recording the geographic setting location, soak period, and retrieval date of each sampled pot, standard methods for contents evaluation included identifying and enumerating all commercially important male and female crabs and other marine species captured, obtaining a complete or representative tally of crab size frequencies and molting condition by sex, and determining the reproductive status of female crabs.

For the purposes of this report, only incidental red king crabs encountered in pots sampled during the 1990/91 - 1994/95 Tanner crab seasons are described, and are characterized by size, sex, total and average catches per pot, and geographic distribution in the fishery. Following are terms related to the discussion of sampled red king crabs:



*Carapace*

*Length (CL)* - the straight line distance across the carapace of male and female crabs from the posterior margin of the right eye orbit to the medial-posterior margin of the carapace; commonly referred to as the "biological size" of the crab.

*Legal Size* - the straight line distance across the carapace of male crabs at a right angle to a line midway between the eyes to the medial-posterior margin (including the spines); equal to at least 6.5 inches for commercial retention of crabs in the Bristol Bay fishery.

*Mature* - male and female crabs that have attained a biological size at which 50 percent or more of a random sample of individuals are physiologically capable of mating; females equal to or greater than 90 millimeters (mm) CL, and males equal to or greater than 120 mm CL (Schimdt and Pengilly, 1995).

*Immature* - male and female crabs that have not attained a biological size at which 50 percent or more of a random sample of individuals are physiologically incapable of mating; females less than 90 mm CL and males less than 120 mm CL (Schimdt and Pengilly, 1995).

## RESULTS AND DISCUSSION

### *Fishing and Sampling Effort*

Large numbers of commercial crabbing vessels have fished Tanner crabs in the Bering Sea in recent years. According to harvest reports derived from ADF&G fish tickets between 1990 and 1995, vessel effort over this period ranged from a maximum of 296 participants in the 1993/94 season to a minimum of 183 vessels in 1994/95 fishery (Morrison et al., 1995). During each respective year catcher-processors carrying onboard observers comprised at least 5 percent of the fishing fleet, and nearly 9 percent during the 1990/91 and 1991/92 seasons (Ward et al., 1995). A complete listing of observed vessels relative to total vessel effort from 1990 to 1995 is provided in Table 1.

As mentioned previously, the distribution of Tanner crab fishing effort has historically encompassed a broad geographic area. Between the 1990/91 and 1992/93 seasons pot pulls reported east of 163° W. longitude comprised approximately 10 percent of the total pots lifted during the fishery. More than 1,000,000 Tanner crab pot lifts were reported west of 163° W. longitude annually in the 1991/92 and 1992/93 fishery (Table 1). However, within these years the onset of the Bering Sea snow crab fishery overlapped the regulatory Tanner crab season by as much as 60 days (Morrison et al., 1995). As a result, Tanner crabs were often legally retained as incidental catch in pots targeting snow crabs, and numbers of pot lifts reported on ADF&G fish tickets were routinely applied to directed harvest statistics for both species. Since 1993, the Tanner crab season has annually concluded prior to the snow crab fishery opening, and pot lifts reported in 1993/94 and 1994/95 (Table 1) are likely more representative of actual directed fishing effort in the preceding years.

A total of 3,850 pots were sampled for contents in the Tanner fishery between 1990 and 1994. During the 1990/91, 1991/92 and 1992/93 seasons, 22 percent of these samples were collected from

pots fished east of 163° W. longitude. Shellfish observers sampled nearly 1,500 pots during the last two years of the fishery, and as a result of the 1993 closure of Bering Sea waters east of 163° W. longitude to directed Tanner crab fishing, these data solely reflect fishing effort west of the restricted area. The proportion of pots sampled to those fished both east and west of 163° W. longitude comprised less than one percent of the reported totals during any of the respective seasons.

Sampled pot soak times spanned a broad range - from as much as 1 to 56 days - in any given year of the fishery. Even so, the average pot soak time progressively decreased over the five year period, from 3.7 days in the 1990/91 season to 1.7 days in 1994/95. An annually successive decline in the harvestable surplus of Tanner crabs, the resultant shorter fishing seasons, and the imposition of pot limits in 1993 (Morrison et al., 1995), coincided with and were likely major factors contributing to the reduction in pot soak periods.

### *Red King Crab Bycatch*

#### **Abundance and Size Composition**

Summarized results of pot sample data revealed a substantial incidental catch of male and female red king crabs during the 1990/91, 1991/92, and 1992/93 Tanner crab seasons, the large majority of which were observed in catches east of 163° W. longitude. In the 1990/91 fishery more than 4,000 red king crabs were encountered in 252 pot samples collected from this area (Table 2). Females comprised 60 percent of the total red king crab bycatch, and averaged 11 per pot. Incidental catch of red king crabs documented during the following year in observer samples collected east of 163° W. longitude also exceeded 4,000 animals; and although only 89 pots were examined for contents, an average of nearly 38 females per pot comprised 81 percent of the reported bycatch. In the 1992/93 fishery 65 pot samples were collected east of 163° W. longitude, and the bycatch of red king crabs was proportionately similar to that observed during the 1990/91 season. Legal sized male red king crabs were included in the incidental catch in this area during each of the respective seasons and ranged from an average of .7 to 3.5 animals per pot. Undersized male crabs comprised approximately 20 percent of the incidental catch east of 163° W. longitude between 1990 and 1993.

In the year following regulatory closure of fishing grounds east of 163° W. longitude (and the required reduction of Tanner pot tunnel height openings from 5 to 3 inches), the incidental catch of red king crabs remained constant in comparison to data collected in the same geographic area during previous seasons. However, when compared to the annual average bycatch of red king crabs observed in 1990/91 - 1992/93 fishery east and west of 163° W. longitude, the number of males and females per pot documented in the 1993/94 season amounted to a 1,000 percent decrease in relative abundance. A total of only 31 red king crabs (including 1 female) were recorded in 415 sampled pots during the 1994/95 Tanner season.

Prior to implementation of the area closure and 3 inch tunnel height regulation in the Tanner crab fishery, incidental red king crabs observed in bycatch samples collected east and west of 163° W. longitude encompassed a broad spectrum of size classes. During the 1990/91 fishery female red king crabs measured in bycatch east of 163° W. longitude ranged from 72 to 150 mm CL and averaged 111 mm CL (Figure 1). Females documented west of 163° W. longitude in this fishery also averaged 111 mm CL, although the largest crabs measured did not exceed 140 mm CL. The vast majority of

female red king crabs captured annually - both east and west of 163° W. longitude - were sexually mature animals, as immature female crabs comprised less than 10 percent of the bycatch in the 1990/91 and 1992/93 seasons (Figures 2 and 3).

The size distribution of male red king crabs measured in both areas during the respective seasons also included animals as small as 72 mm, although the most commonly occurring males ranged between 132 mm and 136 mm CL, and several crabs as large as 180 mm CL were observed (Figures 1, 2, and 3). As mentioned previously, legal sized males were relatively abundant both east and west of 163° W. longitude and in fact, the average CL of crabs observed in the western area between 1990/91 and 1992/93 was at or above the biological size index correlated to legal width for the Bristol Bay population (Stevens et al., 1995). Correspondingly, immature male red king crabs constituted from 10 to 15 percent of males sampled west of 163° W. longitude during the same time period. Immature males observed east of 163° W. longitude ranged from 26 to 60 percent of the total catch in the fishery between 1990/91 and 1992/93.

Even though summarized statistics from observer pot samples collected in the 1993/94 and 1994/95 Tanner crab fishery revealed a substantial reduction in the abundance of red king crab bycatch, the size distribution of males measured during these seasons appeared relatively similar to previous years data. Male crabs averaged 122 and 139 mm CL in the respective seasons, although a combined total of less than 250 measurements were taken (Figure 4). Red king crab females averaged 110 mm CL in the 1993/94 fishery; only one female was caught and measured during the 1994/95 season.

## **Distribution**

The precise geographic dispersion of pot sample locations and red king crab bycatch in the 1990/91 - 1992/93 Tanner crab fishery east and west of 163° W. longitude is illustrated in Figures 5, 6, and 7 respectively. Based on these data plottings, there appeared to be little variation in the distribution of directed Tanner crab fishing effort over the 3 year period. The dispersal of incidental male and female red king crab catches east of 163° W. longitude also remained relatively constant, although as previously discussed, during a given year female crabs - mature and immature animals - constituted the majority of the observed bycatch.

The incidence of red king crabs in pots sampled west of 163° W. longitude was recorded almost exclusively on fishing grounds adjacent to the eastern area in the 1990/91 and 1991/92 seasons, but was comparatively prevalent in waters surrounding the Pribilof Islands in the 1992/93 fishery.

The results of annual NMFS Bering Sea crab stock assessment trawl surveys conducted between 1990 and 1994 show a spatial distribution of red king crabs in the areas of traditional Tanner crab fishing effort very similar to that documented by observer pot sampling during the fishery (Appendix A). With the exception of analyzed results from the 1994 survey, high densities of female crabs, particularly immature animals, have generally been found at approximately 161° to 162° W. longitude, and 56° to 56°30' N. latitude. Comparisons of the survey results to observer pot sample data collected during respective years seem to indicate these age classes of females typically remain sedentary in the period between the summer stock assessment studies and the autumn commercial Tanner crab fishery. Fewer red king crabs were found in this area in the 1994 survey however, and the absence of all commercial crab fishing activity east of 163° W. longitude during that year

eliminated an opportunity to obtain a source of spatially comparative data from observer deployments.

## COMPENDIUM

The collection of management information and descriptive biological data by shellfish observers continues to be an important component of monitoring the short and long term dynamics of the Bering Sea/Aleutian Islands crab populations and the commercial fisheries. Facts and figures pertinent to potential population recruitment, incidental bycatch of other species, and vessel fishing activities have been extensively utilized by research biologists and fishery managers in the period since the inception of the program.

Although the established sampling methodologies utilized by observers are largely based on the principles of inferential analysis, summarized information presented in this report is solely descriptive in nature and should only be regarded within that context. There are numerous variables that may be considered in the interpretation of pot sample data such as soak times, gear types, fishing depths, and the chronology of sampling effort, all of which can affect results. In addition, it should be recognized that potential differences in catch rates and fishing locations between catcher-processor and catcher vessels may also influence the representative character of pot sample data.

## LITERATURE CITED

- Alaska Department of Fish and Game (ADF&G). 1993. ADF&G Observer Manual for Alaskan Crab Processors, 1993 Edition. Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak (unpublished report).
- Morrison, R., and R. Gish. 1996. Annual Management Report for the Shellfish Fisheries of the Bering Sea Area, 1994. In: Annual Management Report for the Shellfish Fisheries of the Westward Region, 1994. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K96-xx *in press*, Kodiak.
- Schimdt, D., and D. Pengilly. 1995. Harvest Strategy for Kodiak and Bristol Bay Red King Crab and St. Matthew Island and Pribilof Blue King Crab, 1995. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Special Publication Number 7, Juneau.
- Stevens, B.G., R.A. MacIntosh, and J.A. Haaga. 1995. Report to Industry on the 1995 Eastern Bering Sea Crab Survey. National Marine Fisheries Service, Alaska Fisheries Science Center, Processed Report 96-01, Kodiak.
- Tracy, D. 1995. Biological Summary of the 1993 Mandatory Shellfish Observer Program Database. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K95-14, Kodiak.
- Ward, M., L. Boyle, and G. Pappas. 1996. Annual Management Report for the Mandatory Shellfish Observer Program, 1994. In: Annual Management Report for the Shellfish Fisheries of the Westward Region, 1994. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K96-xx (in press), Kodiak.

Table 1. Commercial fishing and at-sea observer sampling effort in the 1990/91 through 1994/95 Bering Sea Tanner crab seasons.

Fishery <sup>a</sup> Year	Total <sup>b</sup> Vessels	Total <sup>c</sup> Vessels Observed	Total Pots <sup>d</sup> Pulled E of 163°	Total Pots Sampled E of 163°	Total Pots <sup>d</sup> Pulled W of 163°	Total Pots Sampled W of 163°
1990/91	255	23	108,391	282	775,000	595
1991/92	285	22	150,298	89	1,094,035	444
1992/93	294	15	150,453	65	1,050,432	955
1993/94	296	17	-	0	406,282	1,005
1994/95	183	9	-	0	248,494	415

<sup>a</sup>Area E of 163° open to directed Tanner fishing following red king crab fishery closure 1990/91 through 1992/93 seasons; closed following 1993/94 red king crab fishery; closed entirely in 1994/95 season.

<sup>b</sup>(Morrison et al. 1995).

<sup>c</sup>(Ward et al. 1995).

<sup>d</sup>(Morrison et al. 1995).

Table 2. Incidental red king crab bycatch observed in pots sampled in the 1990/91 through 1994/95 Bering Sea Tanner crab fishery seasons.

Fishery <sup>a</sup> Year	Red King Crab Bycatch					
	East of 163°			West of 163°		
	Total Pots Sampled	Total Catch	Avg. Catch per Pot	Total Pots Sampled	Total Catch	Avg. Catch per Pot
1990/91 <sup>a</sup>	252	legal 906	3.5	595	legal 628	1.1
		subgl. 1,031	4.1		subgl. 600	1.0
		fem. 2,794	11.1		fem. 794	1.2
1991/92 <sup>a</sup>	89	legal 277	3.1	444	legal 114	.3
		subgl. 483	5.4		subgl. 100	.2
		fem. 3,377	37.5		fem. 79	.2
1992/93 <sup>a</sup>	65	legal 44	.7	955	legal 57	<.1
		subgl. 218	3.3		subgl. 95	.1
		fem. 870	13.4		fem. 298	.3
1993/94 <sup>b</sup>	0	—	—	1,005	legal 53	<.1
					subgl. 178	.1
					fem. 308	.3
1994/95 <sup>b</sup>	0	—	—	415	legal 6	<.1
					subgl. 24	<.1
					fem. 1	<.1

<sup>a</sup> All pots sampled during the 1990/91 - 1992/93 seasons contained 5" tunnel height openings.

<sup>b</sup> All pots sampled during the 1993/94 - 1994/95 seasons contained 3" tunnel height openings.

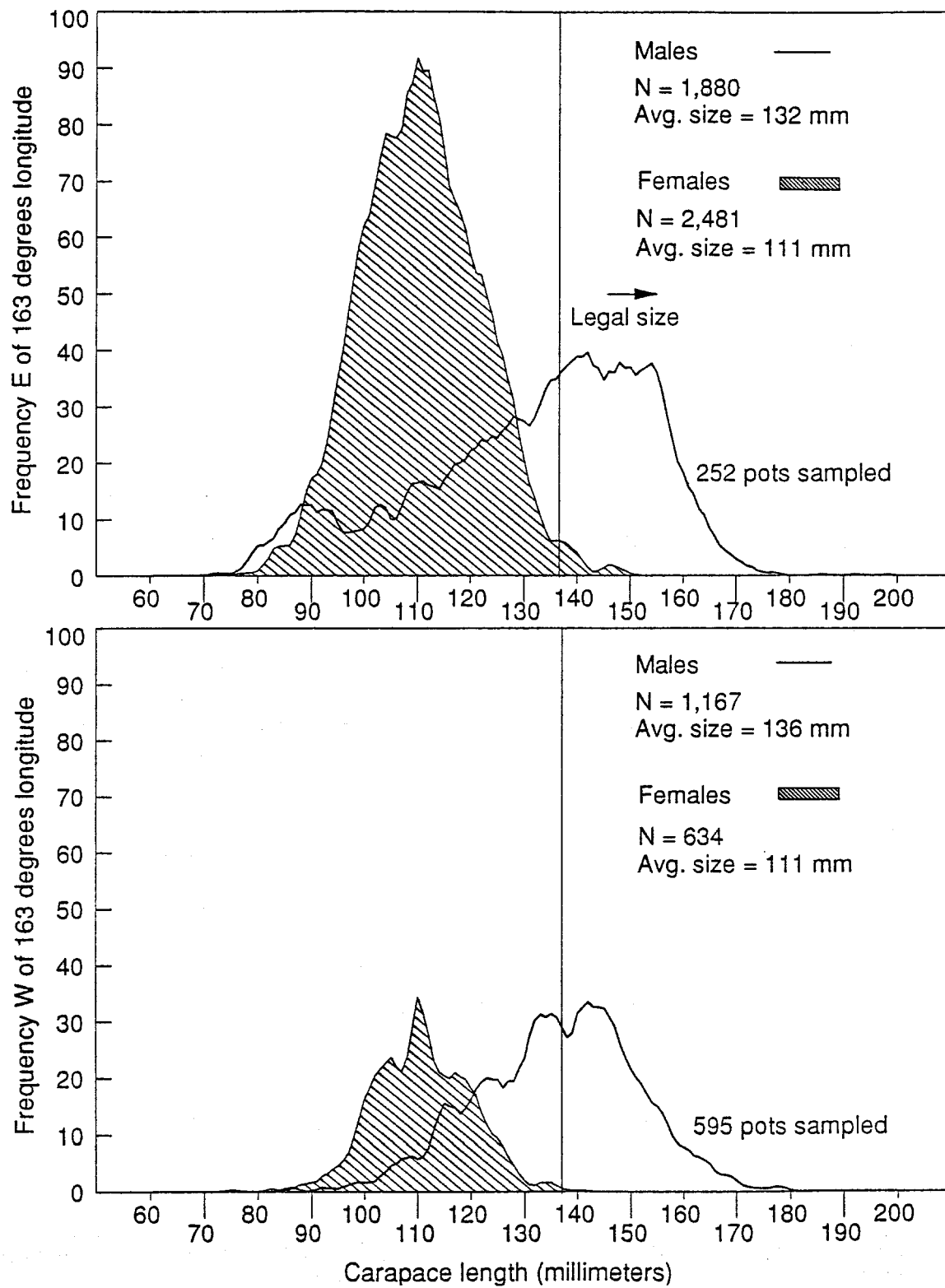


Figure 1. Size distribution of incidental male and female red king crabs observed in pots sampled east and west of 163° W. longitude during the 1990/91 Bering Sea Tanner crab fishery.



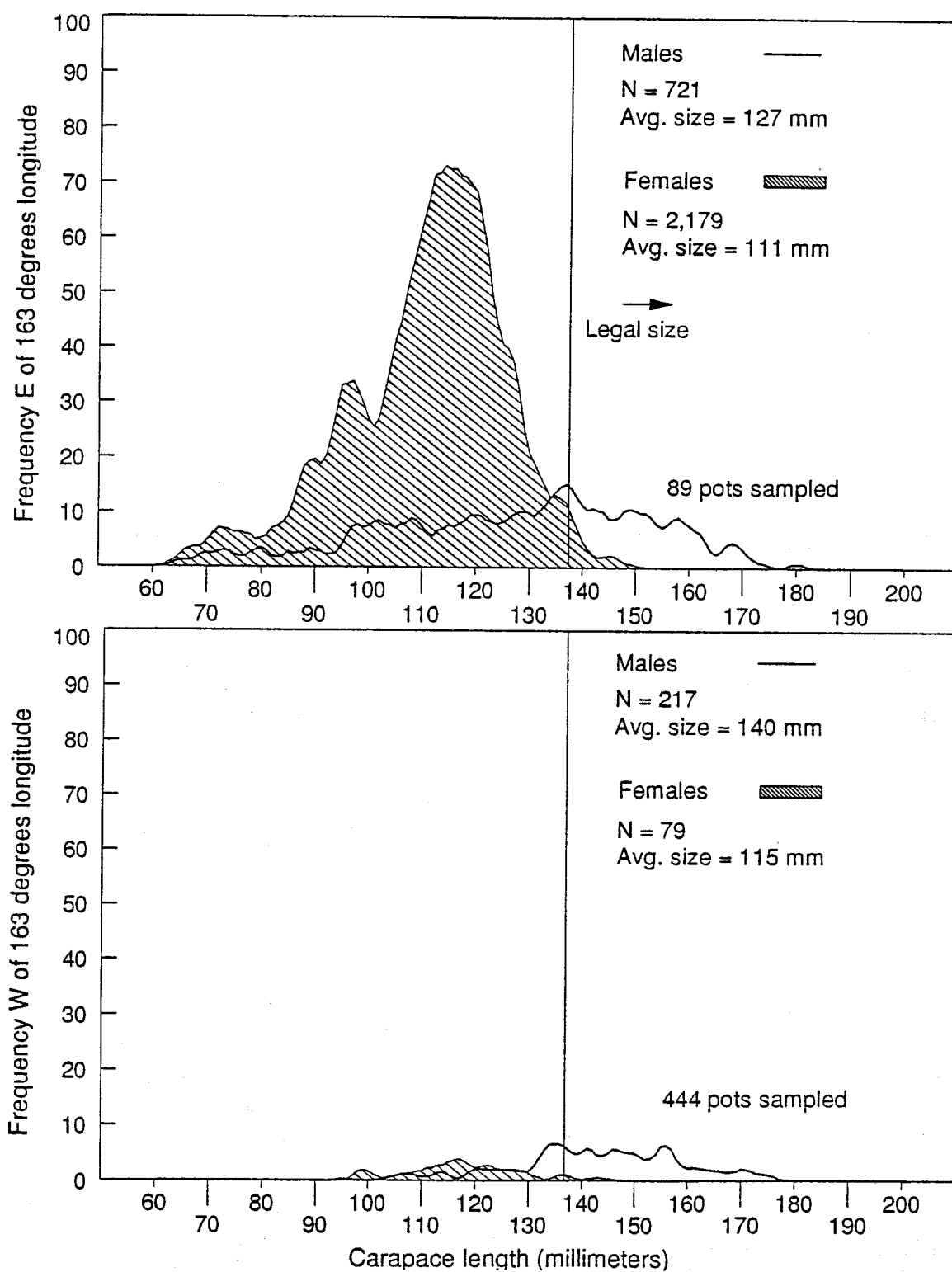


Figure 2. Size distribution of incidental male and female red king crabs observed in pots sampled east and west of 163° W. longitude during the 1991/92 Bering Sea Tanner crab fishery.

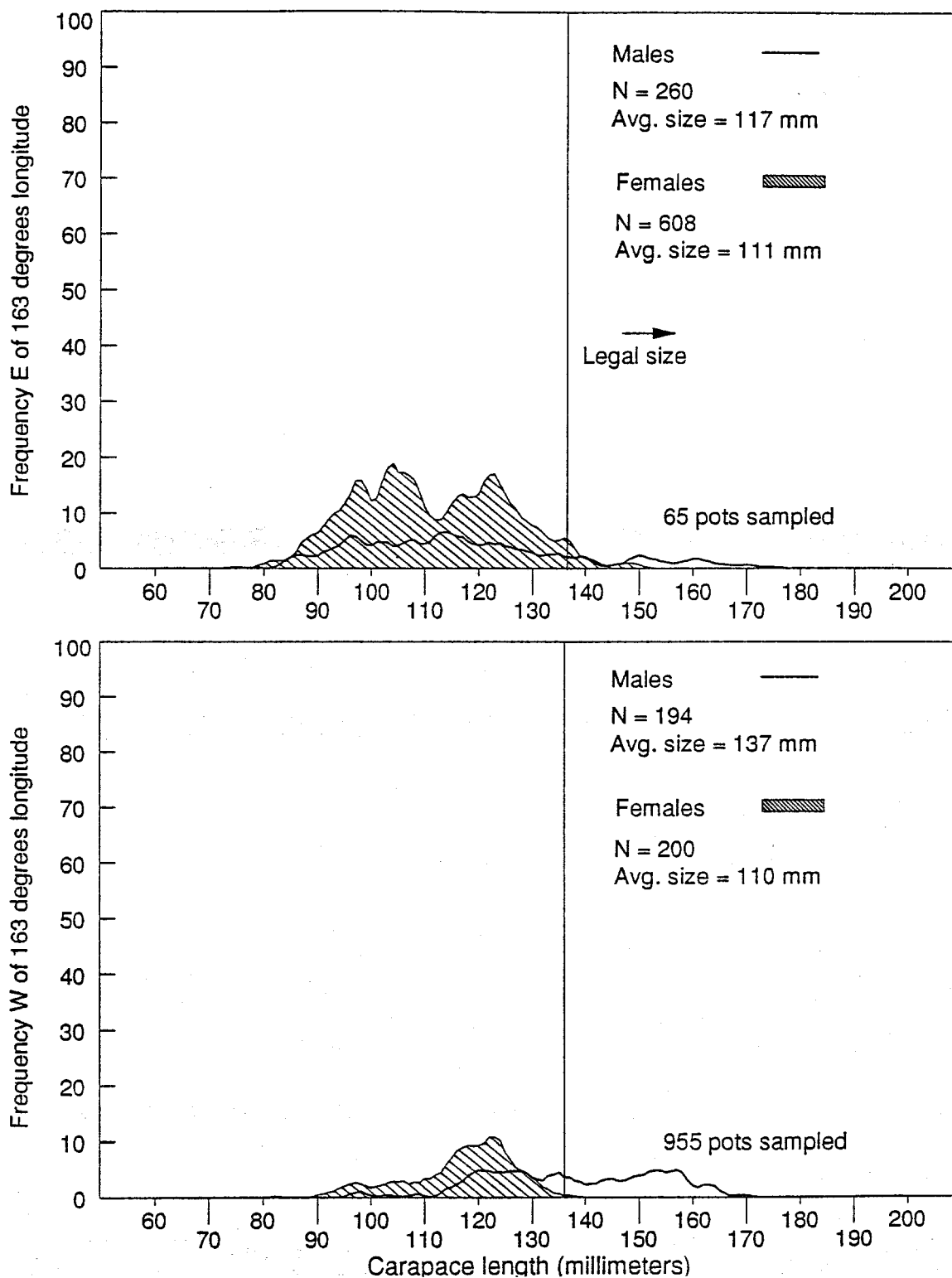


Figure 3. Size distribution of incidental male and female red king crabs observed in pots sampled east and west of 163° W. longitude during the 1992/93 Bering Sea Tanner crab fishery.

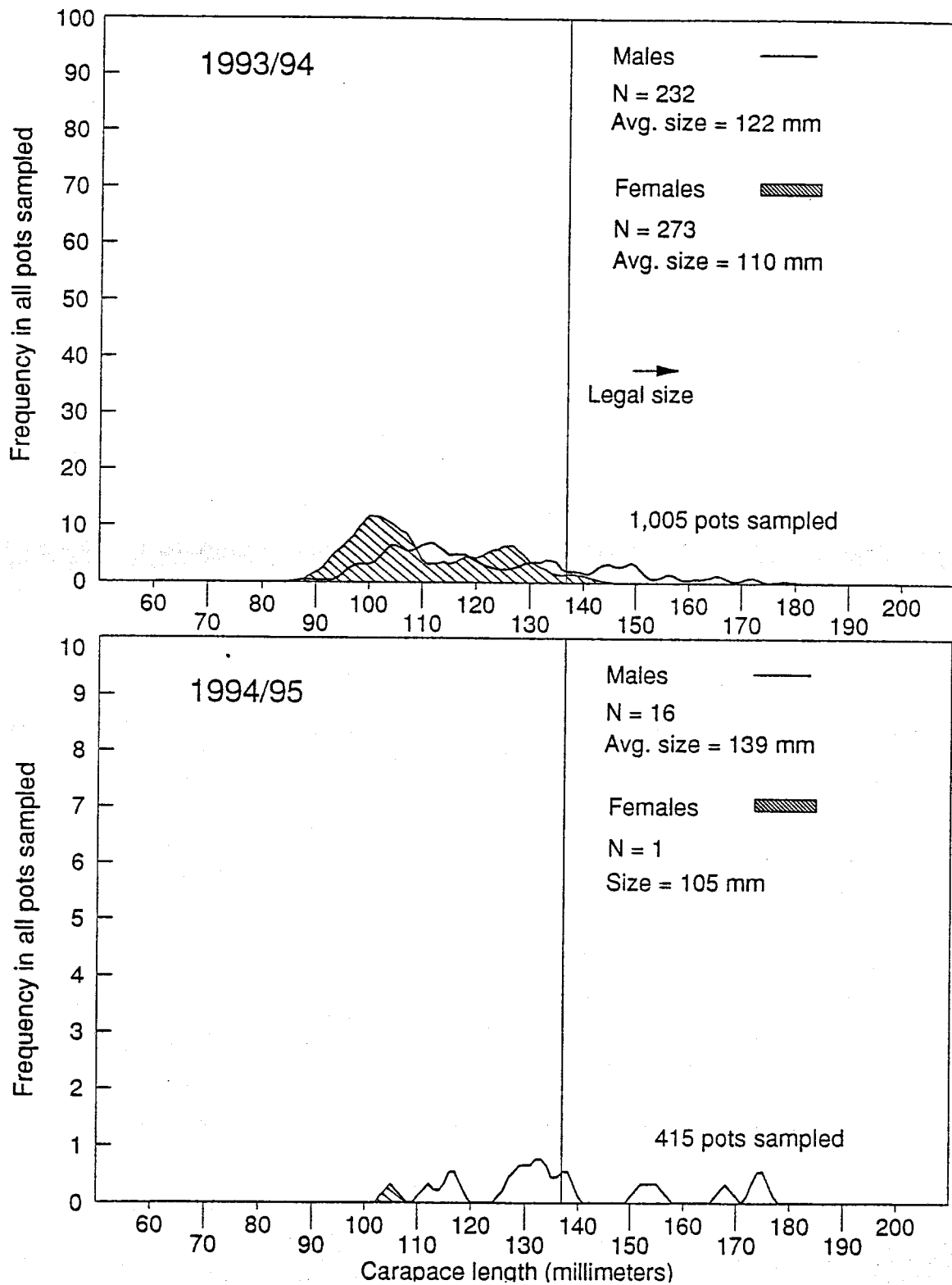


Figure 4. Size distribution of incidental male and female red king crabs observed in pots sampled during the 1993/94 and 1994/95 Bering Sea Tanner crab fishery.

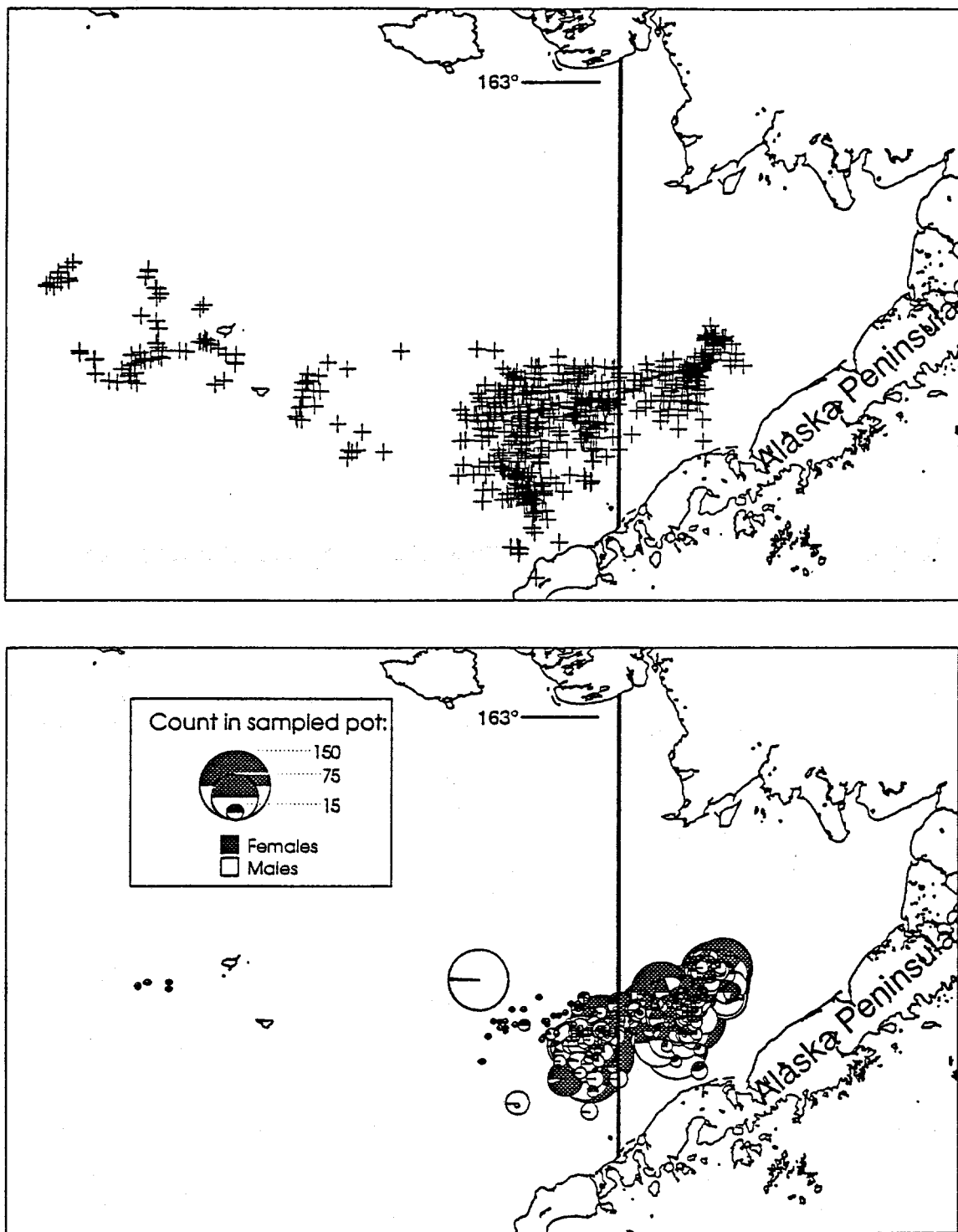


Figure 5. Geographic distribution of pots sampled by observers during the 1990/91 Bering Sea Tanner crab fishery and the corresponding incidental catch of male and female red king crabs.

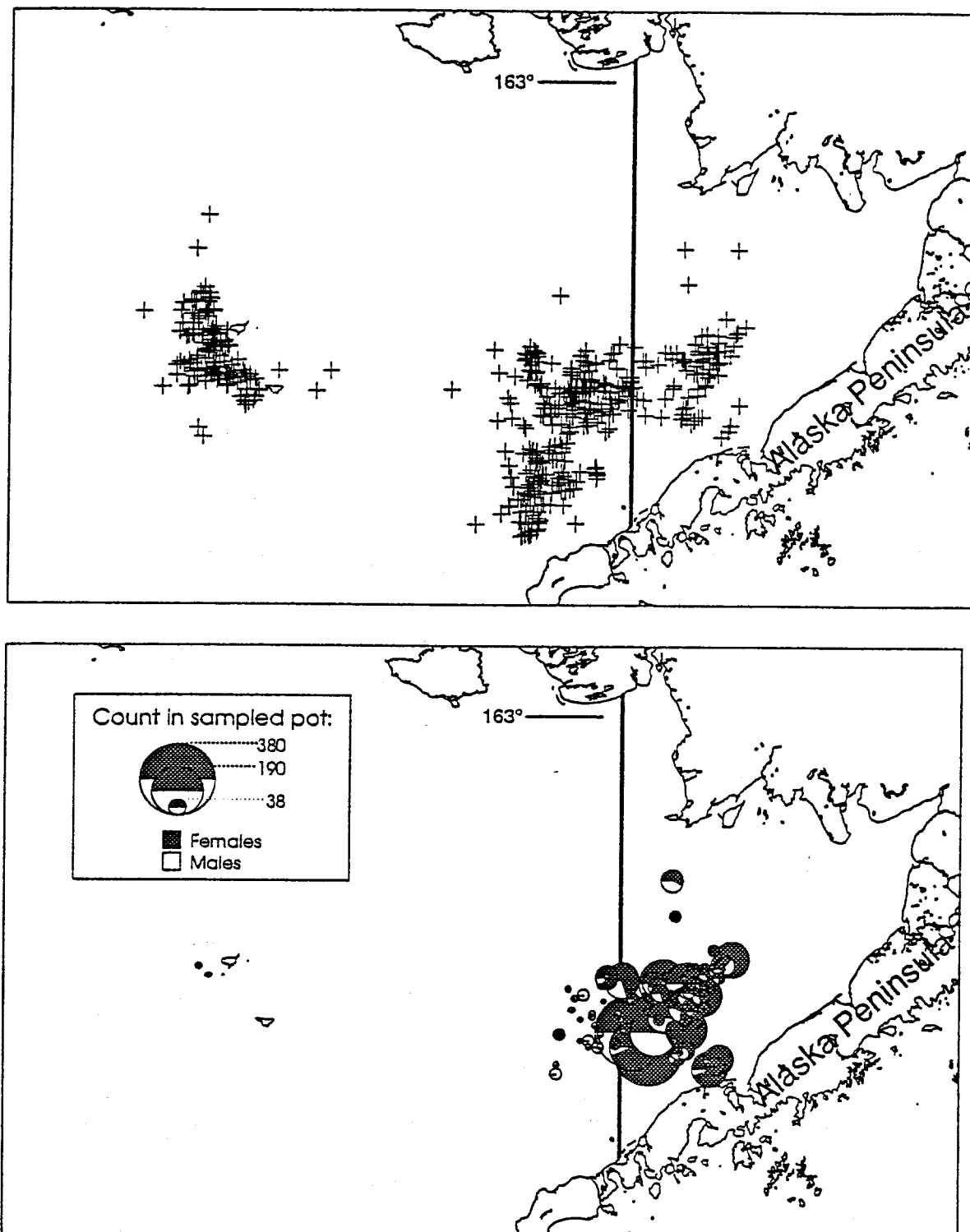


Figure 6. Geographic distribution of pots sampled by observers during the 1991/92 Bering Sea Tanner crab fishery and the corresponding incidental catch of male and female red king crabs.

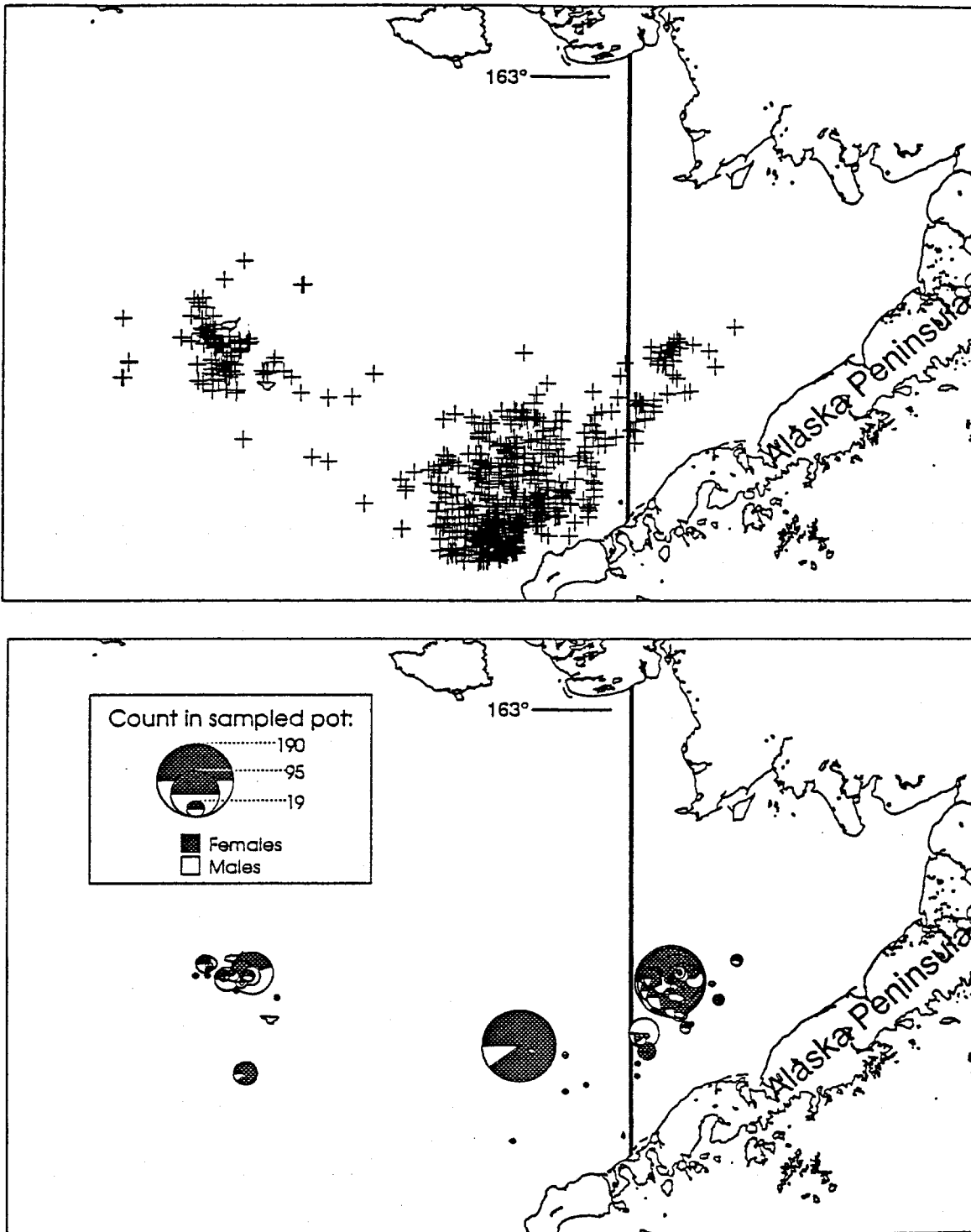
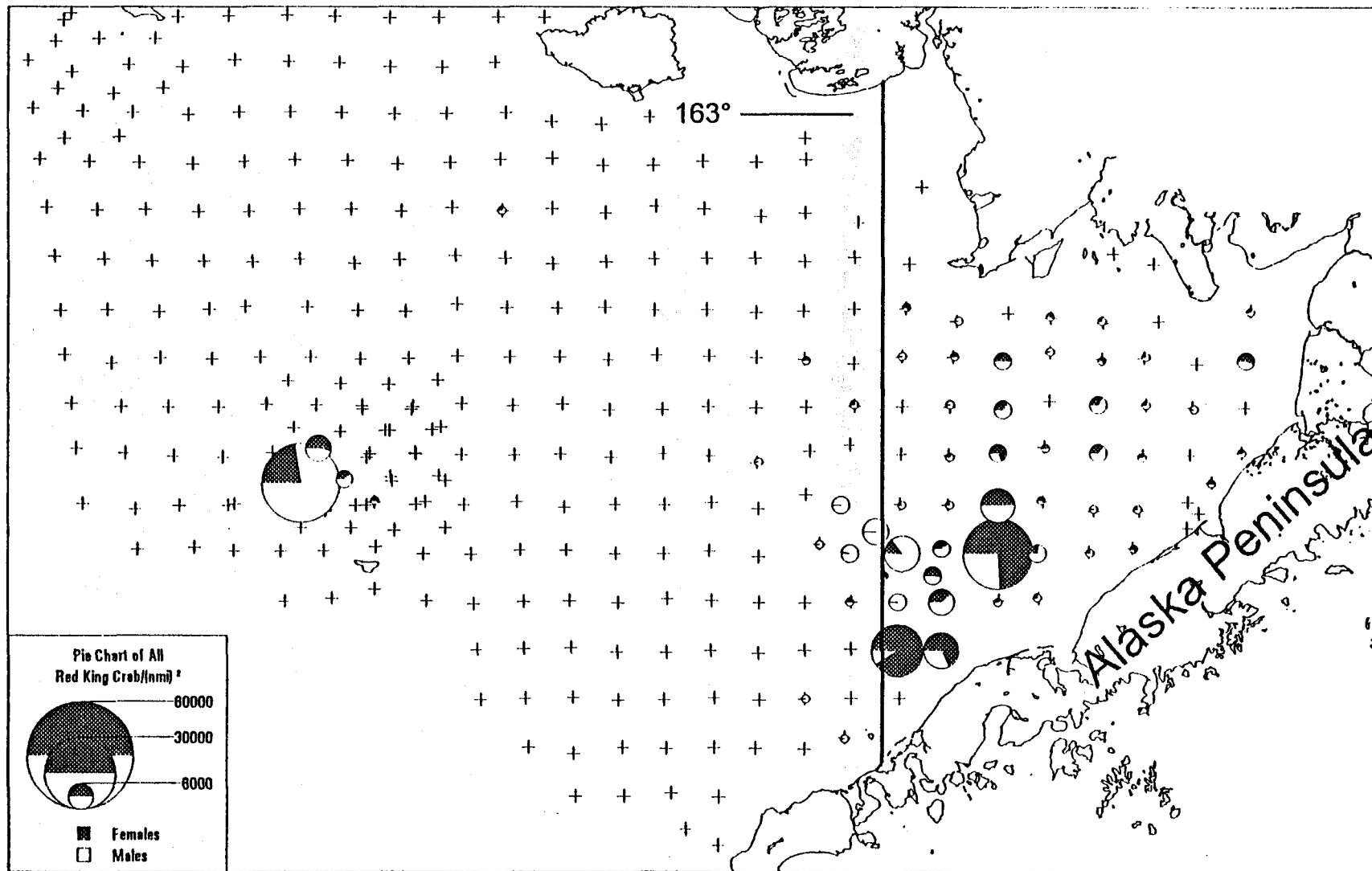


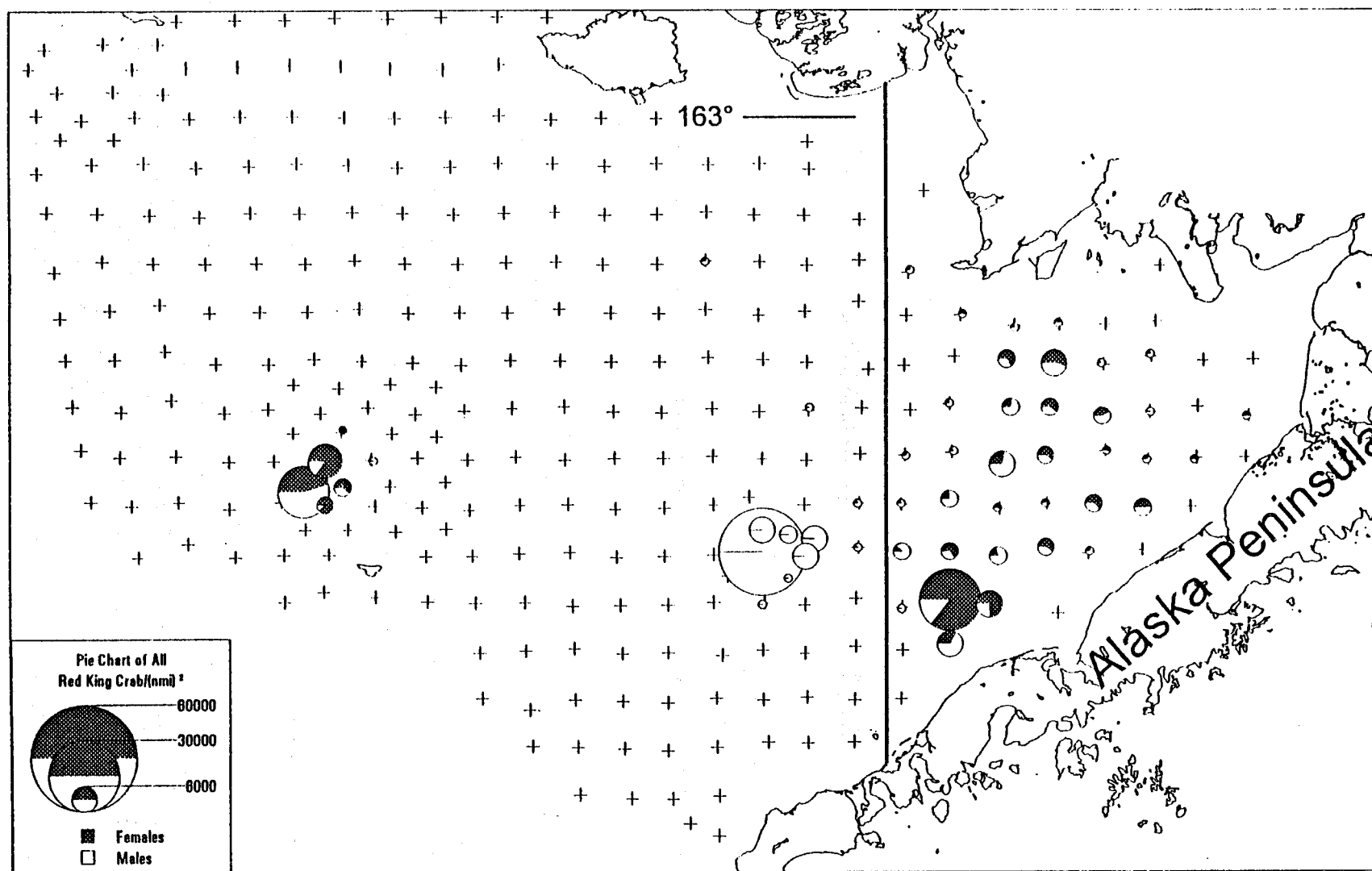
Figure 7. Geographic distribution of pots sampled by observers during the 1992/93 Bering Sea Tanner crab fishery and the corresponding incidental catch of male and female red king crabs.

## APPENDIX

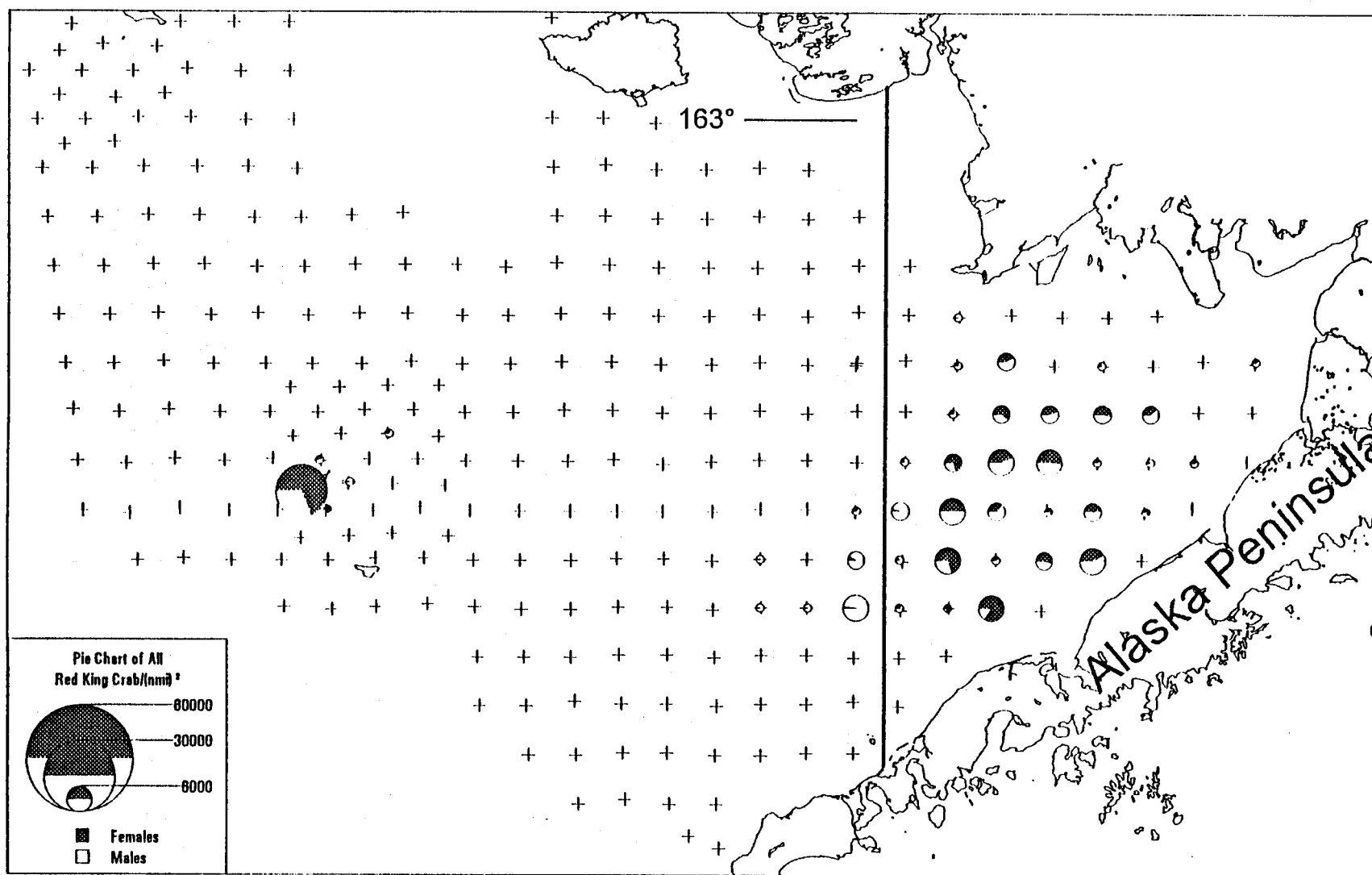


Appendix A1. Geographic distribution of tow station locations during the 1990 NMFS crab stock assessment trawl survey, and the corresponding relative density of male and female red king crabs at each station.

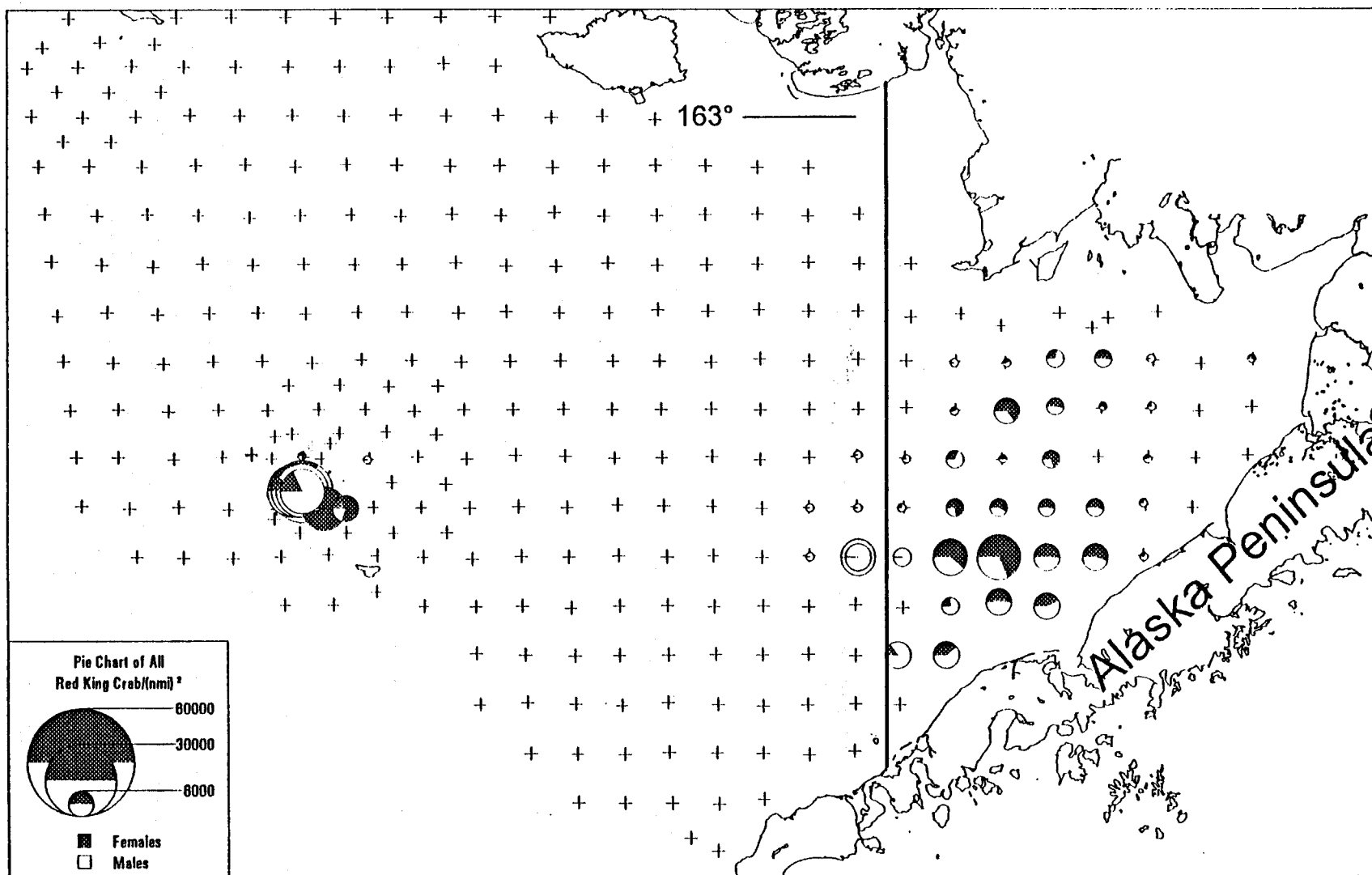




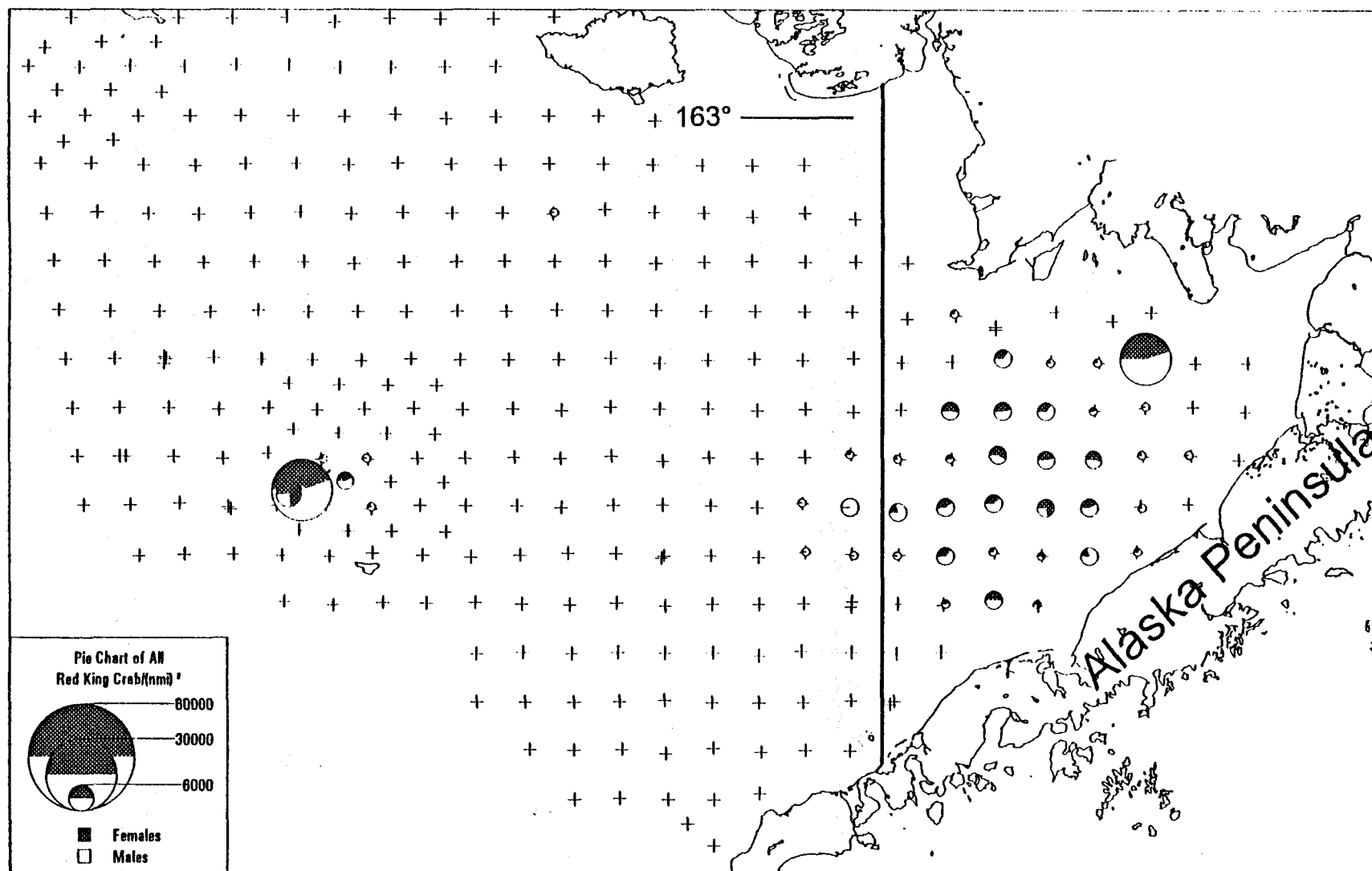
Appendix A2. Geographic distribution of tow station locations during the 1991 NMFS crab stock assessment trawl survey, and the corresponding relative density of male and female red king crabs at each station.



Appendix A3. Geographic distribution of tow station locations during the 1992 NMFS crab stock assessment trawl survey, and the corresponding relative density of male and female red king crabs at each station.



Appendix A4. Geographic distribution of tow station locations during the 1993 NMFS crab stock assessment trawl survey, and the corresponding relative density of male and female red king crabs at each station.



Appendix A5. Geographic distribution of tow station locations during the 1994 NMFS crab stock assessment trawl survey, and the corresponding relative density of male and female red king crabs at each station.

The Alaska Department of Fish and Game administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information please write to ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; U.S. Fish and Wildlife Service, 4040 N. Fairfax Drive, Suite 300 Webb, Arlington, VA 22203 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-6077, (TDD) 907-465-3646, or (FAX) 907-465-6078.